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The Challenging Arithmetic of Poverty in Bangladesh

Martin Ravallion

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This paper — a product of the Agricultural Policies Division, Agriculture and Rural Development Department — was prepared as a background paper for the *1990 World Development Report* on poverty. The paper draws on results from a PRE research project, Policy Analysis and Poverty: Applicable Methods and Case Studies. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact the World Development Report office, room S13-060, extension 31393 (32 pages).

Did poverty increase in Bangladesh in the 1980s? How responsive is poverty in Bangladesh to economic growth and changes in relative inequalities? What are the prospects for poverty alleviation through currently anticipated economic growth in Bangladesh?

Ravallion addresses these questions using a narrow definition of poverty, whereby a person is judged to be poor if he or she resides in a household the income of which does not allow a consumption level that permits adequate nutrition. He concludes:

- The recent evidence of a decline in absolute numbers of poor in Bangladesh in the 1980s is unconvincing. The rate of growth in real per capita consumption of 10 percent a year implied by the underlying household spending surveys is too high to be believed. One cannot assume that the national accounts are accurate, but their implied growth rate of about 0.5 percent a year is more plausible. Assessments of growth in the 1980s consistent with national accounts data (using household surveys only to measure *relative* inequalities) suggest that the proportion of the population deemed to be poor has remained fairly stable in recent years — while absolute numbers of poor have increased.

- Per capita growth rates in Bangladesh have been below average for South and Southeast Asia in the 1980s, and few observers expect this to change in the 1990s.

- The growth rates needed to prevent an increase in the absolute numbers of poor in Bangladesh, or to attain any given rate of poverty reduction, are higher than similar calculations have suggested would be needed for some other low-income countries in Asia. At a widely assumed poverty line for Bangladesh, the growth rate of real consumption per capita must be at least equal to the rate of population growth before the absolute numbers of poor can start to fall appreciably without a shift in relative inequalities. Such a growth rate has not been achieved in recent times, but is expected over the next 10 years or so by some observers.

- Recent growth in Bangladesh has been relatively low in a country where it needs to be relatively high to avoid an increase in the number of poor.

- Certain changes in relative inequalities could, in principle, wipe out poverty alleviation through growth. It appears that a fairly substantial change would be needed to do so for the simple headcount index of poverty in Bangladesh. However, other measures of poverty — which reflect changes in living standards of the poorest — will be more sensitive to how equitable the growth process is in the near future.

- Any poverty alleviation strategy for Bangladesh should strongly encourage domestic policy reforms and international assistance that not only enhance the rate of growth but also ensure that its benefits are shared widely.

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The Challenging Arithmetic of Poverty in Bangladesh*

by
Martin Ravallion

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I. Introduction

The arithmetic of poverty in Bangladesh is challenging from a number of perspectives. Counting Bangladesh's poor is difficult to do with seemingly tolerable precision, even just to get some idea of whether recent efforts to alleviate poverty have succeeded. But that is only the beginning of the challenge. The details of how we muster resources, and design and implement effective policies - the arithmetic of poverty alleviation in Bangladesh - pose a severe challenge to policy analysts, governments, and the international community.

The aim of this paper is to offer a critical assessment of recent evidence relevant to these issues. I hope to throw light on three main questions: i) Has poverty decreased in Bangladesh during the 1980s? ii) How responsive is poverty in Bangladesh to economic growth and changes in relative inequalities? iii) What are the prospects for poverty alleviation through currently anticipated economic growth in Bangladesh?

I shall restrict attention to a narrow definition of "poverty", whereby a person is judged to be poor if (and only if) he or she resides in a household whose income does not permit attainment of a pre-determined consumption bundle, as judged necessary for the fulfillment of certain basic consumption needs, most importantly (in this context) adequate nutrition. There are aspects of individual welfare which this definition cannot capture, such as access to publicly provided goods; the cleanliness of drinking water, for example, matters to one's standard of living, but it is unlikely to be reflected well in consumption or income, as usually measured. Nor does the definition have anything to say about how consumption is actually distributed within the household. But the narrow definition of poverty used here probably

does capture much of what does matter to individual living standards in Bangladesh - most importantly the adequacy of household food entitlements - and it is at least a tractable definition for empirical analysis. Probably for this reason, it has been the most common definition in past studies of poverty in Bangladesh, as elsewhere.

The following section takes a close look at some recent data suggesting that the problem of poverty in Bangladesh may be diminishing quite rapidly. In section III, I will offer an empirical assessment of how much impact on poverty in Bangladesh we might expect from economic growth, and from changes in overall inequality. Section IV offers some conclusions.

II. Has Poverty Increased or Decreased in Bangladesh During the 1980s?

Estimates from various surveys during the 1970s indicated a rising prevalence of poverty in Bangladesh (Muqtada, 1984; ILO, 1985; Islam and Khan, 1986; Rahman, 1986; Alamgir and Ahmed, 1988). Has this trend reversed in the 1980s?

Some Recent Evidence

The Bangladesh Bureau of Statistics (BBS) has recently published estimates of poverty for various years in the 1970s and 80s. Using the Household Expenditure Surveys (HES), BBS (1988b) give estimates of the absolute number, and proportion of the population, that were unable to attain a caloric intake of at least 2122 calories per person per day (a popular poverty line for Bangladesh; also see Alamgir, 1978). These estimates appear to have been based on a comparison of actual household expenditure with an

estimated expenditure needed to reach this caloric requirement, though the details of estimation are unclear from the information given in BBS (1988b).

The BBS results show a substantial decrease in the proportion of the rural population who were deemed poor, from 83% in 1973/74 to 74% in 1981/82, then dropping quite sharply to 51% in 1985-86. The estimates show a similar (though less dramatic) contraction in the prevalence of urban poverty. While the BBS figures suggest that the absolute numbers of poor increased during the 1970s, a sharp decline in rural areas during the 1980s is indicated, though this was partly mitigated by an increase in the numbers of poor in urban areas. Nonetheless, the BBS figures show an impressive recent record in poverty alleviation, with aggregate numbers of poor declining from 67 million in 1981/82 to 51 million in 1985/86.

Skeptics have pointed to a number of problems in comparing BBS's Household Expenditure Surveys over time. For one thing, there are differences in sample coverage; for example, while the 1981/82 HES surveyed about 9,500 households (0.05 percent of the population), this dropped to just 3,800 (0.02 percent) for the 1985/86 HES. There have also been some changes in the questionnaire used, with implications for the measurement of household incomes and consumptions, such as in the methods used for imputing the value of food consumption from own production.

So there are good reasons to ask: How <u>robust</u> is this seemingly excellent recent record on poverty alleviation to possible inconsistencies over time in the underlying household expenditure surveys, on which the estimates of poverty have been based?.

One possible clue can be obtained from an alternative source of data on aggregate incomes and consumption, namely Bangladesh's national accounts (NA).

It cannot assumed that the national accounts are more accurate, but dramatic discrepancies with that source would clearly be worrying. The national accounts may not provide a better estimate of average consumption than the HES, but (given the aforementioned changes over time in HES methodology), the NA series is probably a better basis for comparing consumption aggregates across time during the 1980s.

Table 1 gives my estimates of real consumption per capita in Bangladesh based on both the HES and the NA. For urban areas, I have used the Consumer Price Index (CPI) for middle income groups in Dhaka, while for rural areas I have used the average CPI for rural areas. Consumption from NA is estimated from the "World Tables" (World Bank, 1988).[1]

The results in Table 1 reveal substantial divergence between the HES and NA means for 1983/84 and (even more so) 1985/86, though the two sources are in close accord for 1981/82.[2] However, for the purposes of comparing poverty levels over time, the more disturbing observation from Table 1 is the discrepancy in growth rates between the two data sources. The national accounts suggest that real consumption per capita grew at the compound annual rate of 0.5% over the period 1981/82-1985/86; the household expenditure survey on the other hand implies a compound annual growth rate of 9.9%, which would have been one of the highest recorded for any country in the world over this (generally difficult) period, or at other times for that matter. While the NA may well be underestimating the true rate of growth, it is very hard to believe the rate of growth implied by the HES.

An Alternative Assessment

Overestimation of the growth rate in real consumption will lead to overestimation of the rate of poverty reduction. To help assess how much overestimation may be involved, I have calculated measures of poverty by two methods. One relies exclusively on the HES (following conventional practice), while the other uses information on mean consumption from the NA to supplement the data on relative inequalities from HES. The latter method illustrates a new and potentially useful methodology for other purposes, so some elaboration is called for. The idea is that one derives formulae for the poverty measures of interest as functions of the mean of the distribution, and a set of other parameters describing the Lorenz curve, which summarizes all relevant information about relative inequalities. The latter parameters are estimated econometrically. From these formulae one can then estimate the poverty measure that would be obtained if the mean changed, holding the Lorenz curve constant; thus one can estimate the poverty levels that would hold if the mean was that obtained from NA, rather than HES, holding the Lorenz curve constant.[3] The Appendix gives details.

We should be clear about the purpose of these calculations. Their aim is not to come up with the "best" measure of the magnitude of poverty in Bangladesh, or even a "better" one than that used by BBS. Rather, the objective is to test the robustness of the BBS estimates of how poverty has changed in Bangladesh during the 1980s.

Various measures of poverty will be considered, aiming to embrace the range of possible value judgments on this issue. The proportion who are poor, or "headcount index of poverty", implicitly treats all of the poor identically; no distinction is made amongst the 50-60 million poor in

Bangladesh in terms of the depth of their poverty. And it is plain from at least casual observation that the poor are not all equally poor. So I shall also consider two alternatives to the headcount index, both of which are members of the Foster, Greer and Thorbecke (FGT) (1984) class of additively decomposable poverty measures, each member of which is identified by a non-negative parameter α. The headcount index is also a member of this class. The three FGT measures used here are:

(i) The headcount index of poverty given by the percentage of the population living in households with average consumptions below the poverty line; this is the FGT measure for $\alpha = 0$. While this is a simple measure to interpret, it has the disadvantage that it is entirely insensitive to changes below the poverty line; for example, a poor person may become poorer, but measured poverty will not change.

(ii) The poverty gap measure, defined as the consumption deficit of the poor as a proportion of the poverty line divided by the population size; this is the FGT measure for $\alpha = 1$. Thus, letting $g=(z-y)/z$ denote the proportionate poverty deficit of a person with income or consumption y below the poverty line z, and setting $g=0$ for the non-poor, the FGT poverty gap measure is simply the arithmetic mean of g over the whole population. The measure is then also equal to the average poverty deficit of the poor times the headcount index of poverty.

(iii) The distributionally sensitive FGT measure, whereby, instead of weighting the various poverty deficits of the poor equally (as in the previous measure) they are weighted by the deficits themselves. The resulting measure is then simply the mean of the squared proportionate poverty deficits i.e., $\alpha = 2$. This measure satisfies the main axioms for a desirable poverty measure

found in the theoretical literature (for a recent survey see Foster, 1984), including Sen's (1976, 1981) Transfer Axiom which requires that when income is transferred from a poor person to someone who is poorer measured poverty decreases. Neither measures (i) nor (ii) satisfy this condition. It also has advantages over a number of alternative distributionally sensitive measures, such as the Sen index. For example, the FGT measure is additively separable; aside from the advantages of that property for constructing decompositions of poverty ("poverty profiles"), it implies that when any subgroup of the population becomes poorer, aggregate poverty will also increase, ceteris paribus (Foster and Shorrocks, 1987).

We do not have any alternative data to the HES when estimating the distribution of consumption in Bangladesh around the mean. So I have little choice but to assume that the Lorenz curve from the HES is correct at each date. It should, however, be noted that one possible explanation for the high HES means for the later years is an undersampling of poor households, which would also lead to a bias in the Lorenz curve.

Figures 1 and 2 give the estimated Lorenz curves and Gini indices for Bangladesh, for urban and rural areas respectively, over the three HES years. The most notable point here is how little relative inequalities have changed within the rural sector; the Lorenz curves for these three years are virtually indistinguishable, and Gini indices are identical to two decimal places. Changes in overall inequality have been primarily due to changes in inequality within the urban sector, and inequality between sectors. A decline in inequality in urban areas after 1981/82 is indicated, though it did not continue after 1983/84. The same pattern holds for inequality between sectors (as measured by the urban/rural disparity in means) though doubts have been

cast on the accuracy of the sample means for the later dates, as discussed above. Inequality is higher (in terms of the Lorenz dominance criterion) in the urban sector for all three years.

A further complication arises concerning the BBS poverty lines. Nominal monetary equivalents of the BBS caloric poverty lines are available.[4] However, there are substantial discrepancies between the implied rates of inflation and those indicated by the aforementioned CPIs, for both urban and rural areas. The BBS poverty lines are of about 15% lower real value in 1981/82 than the two later years, in terms of the CPI bundle of goods.[5] It might be argued that the CPI bundle of goods is inappropriate for adjusting a caloric poverty line. But the BBS poverty lines also have increasing purchasing power in terms of food (using the food component of the Dhaka middle income CPI), and also in terms of the main sources of calories, rice and wheat (using open market prices). While, as a general rule, one may allow the possibility of poverty lines with different real purchasing power, reflecting changing social standards over time (or in different countries), the validity of doing so in this particular context is far from obvious.

For the purpose of this investigation, I have preferred to use poverty lines with constant purchasing power, as indicated by the CPI. The poverty lines used are a consumption per capita of Tk 200 for rural areas, and Tk 300 for urban areas, in 1981/82 prices. These are approximately equal to the BBS poverty lines for 1981/82.[6] I shall refer to these as the "BBS 1981/82 poverty lines". To test the sensitivity of the results to this choice, I shall also give results for lower poverty lines, set at three quarters of the above levels. All calculations are based on the distributions of consumption

expenditure per person for each year; these can be readily calculated from the data given in BBS (1986, 1988 a,b).

Each of the above poverty measures can now be derived as a function of the poverty lines, the parameters of the Lorenz curve, and the means. (See the Appendix for further details). Table 2 gives the estimates obtained for all three of these measures, using both the HES and NA means from Table 1, and the 1981/82 BBS poverty line. I have assumed that the 1981/82 means from the HES are correct; since the two means are very close nationally for that year, there is no obvious reason to doubt that assumption, and this also has the advantage of allowing us to maintain the urban/rural breakdown. (The national accounts are not dissagregated by urban/rural areas). To maintain that breakdown, I have also assumed that the NA consumption growth rates reported in Table 1 hold for both urban and rural sectors. Figure 3 summarizes the results for the headcount index, and the absolute numbers of poor.

The following observations can be made on the results in Table 2:

(i) The estimates of mean consumption per capita based on the HES imply sharply falling poverty levels over the period, as claimed by BBS (1988b), and, indeed, at an even higher rate of decline than they had suggested. This reflects the fact that the BBS poverty lines have increasing real purchasing power over the period, putting upward pressure on their estimates of poverty (though insufficient to eliminate the downward bias due to their apparent overestimation of growth rates). Using the BBS 1981/82 poverty lines and HES means, absolute numbers of poor decline from 66 million persons in 1981/82 to 37 million in 1985/86. The estimates of poverty based on the HES Lorenz curves and the consumption means derived from NA do not, however, confirm this trend. The headcount index fell slightly from 1981/82 to 1983/84 in both

urban and rural areas, but this was followed by a deterioration from 1983/84 to 1985/86. On balance, the headcount index changed little over the period. Absolute numbers of poor in Bangladesh rose from 66 million to 72 million in 1985/86.

(ii) The same basic pattern is found for the lower poverty line, though the decline in the number of poor, as estimated solely from the HES, is now even more dramatic: while 43 million people did not attain three-quarters of the BBS poverty line in 1981/82, this falls to only 14 million in 1985/86. The growth rate estimates from NA, on the other hand, indicate an increase to 46 million in 1985/86.

(iii) The poverty gap measures reported in Table 2 follow a similar pattern to the headcount indices. The consumption deficit of the urban poor normalized by the total urban population represented 22% of the poverty line in 1981/82; for rural areas the proportion is slightly higher, at 25%.[7] Another way of interpreting these figures is to consider the magnitude of the poverty gap as a proportion of mean consumption of all households. The aggregate poverty gap of the urban sector represents 21% of that sector's mean consumption in 1981/82; for rural areas it represented 28% of mean consumption. Roughly a one quarter increase in national consumption would be needed to eliminate poverty in Bangladesh, <u>if</u> that increase could be perfectly targeted at the poor. That is a big "if"; later I shall discuss the problem of reaching the poor when such perfect targeting is not feasible.

(iv) The distributionally sensitive measure of poverty (α=2) indicates a modest overall improvement during the period using the NA means, though, again, the rate of improvement is very considerably less than that implied by the unadjusted HES.

(v) The HES also suggests that urban poverty levels exceeded rural levels after 1981/82. This is surprising. The result is not confirmed by the alternative estimates based on the means from NA. All of these comparisons of urban and rural poverty levels may be, however, highly sensitive to the assumed cost-of-living differential (of about 50%) between sectors implicit in the BBS poverty lines for 1981/82. I have no basis for properly evaluating that assumption.

III. Growth, Inequality, and Poverty

Methodological Issues

There has been much debate about whether poverty is best alleviated by promoting economic growth, or by reducing economic inequalities. The level of poverty can be thought of as a function of mean consumption, the poverty line, and the inequality of consumption around that mean, as embodied in the Lorenz curve. An increase in the mean, holding the Lorenz curve and poverty line fixed, will unambiguously decrease any well behaved poverty measure. Following recent practice, I shall refer to such an increase in the mean as "distributionally neutral growth". Note that this requires an equi-proportional increase at all levels.

Certain shifts in the Lorenz curve will also reduce poverty, holding the mean constant. If the Lorenz curve shifts such that the share of any poor household increases, with the corresponding loss being incurred by any non-poor person, then the outcome is unambiguous - poverty must fall. However, there is little one can say in general about the qualitative effect on poverty of a reduction in inequality;[8] for example, while a small transfer from

someone at the poverty line to someone below it will reduce inequality, it will increase the headcount index of poverty.

One can readily calculate the response of poverty measures to small distributionally neutral changes in the mean. Noting that the headcount index is simply the point on the cumulative distribution function corresponding to the poverty line, any distributionally neutral increase in the mean will have the same effect on the headcount index as a decrease in the poverty line of the same proportion. The point elasticity of the headcount index to distributionally neutral growth is thus given by the elasticity of the distribution function evaluated at the poverty line. This fact appears to be well known. Though the analytics are slightly more complicated, computationally simple formulae for the effects of distributionally neutral growth can also be derived for all other members of the FGT class of poverty measures discussed above.[9]

We would also like to get some idea of how sensitive poverty is to certain changes in overall inequality. Kakwani (1989) has suggested one convenient way of doing so, which assumes that the new Lorenz curve (after the change in inequality) is given by $L(p) - \beta(p-L(p))$ where $L(p)$ is the old Lorenz curve and β is a number measuring the proportionate increase in the Gini index. Roughly speaking, this assumes that the Lorenz curve shifts by a constant proportion of the difference between each income group's actual share and the share that it would have if there were equality. Thus the reduction in inequality can be said to occur at "all levels". Using this assumption, one can readily calculate the point elasticity of any of the FGT poverty measures with respect to the overall Gini index, holding the mean of the distribution constant.

There is no a priori reason why we need be confined to the rather simple stylizations of "distributionally neutral growth", or Kakwani's assumption of a proportionate shift in the Lorenz curve. The use of a point elasticity is also restrictive, when the changes involved are not small. By explicitly modelling the Lorenz curve, one can estimate the effect on poverty of any discrete shifts in either the mean, or the Lorenz curve, or any combination of the two. The results of the previous section illustrated how this can be done for discrete changes in the mean (due to measurement error in that case, though changes due to distributionally neutral growth can be modelled the same way). Explicit shifts in the Lorenz curve can also be simulated. Ravallion and Huppi (1989) discuss the methodology and give examples for Indonesia.

However, in applying these ideas to the Bangladesh data, I shall concentrate solely on point elasticities estimated from the 1981/82 HES. It would certainly be of interest to study further the change in poverty in Bangladesh over time - for example, using the various decomposition formulae in Ravallion and Huppi (1989) - but the doubts about comparability of the HES data for other years must lead one to seriously question any results of such an exercise. All is not lost though, as there is still something that can be learnt about the possible effects of growth on poverty by examining the distribution for only one year.

Prospects for Poverty Alleviation through Growth

Table 3 gives my estimates of the point elasticity of each poverty measure to distributionally neutral growth in Bangladesh, as well as the elasticity with respect to an increase in the Gini coefficient, assuming the proportional Lorenz curve shift described above.

The headcount index of poverty in Bangladesh responds to distributionally neutral growth with an elasticity of about unity, using the BBS poverty line for 1981/82. For example, an annual growth rate in mean consumption per capita of two percent, and at the same rate across the whole distribution, would reduce the proportion of the population who are poor by about two percent per year. This elasticity is lower than those recently estimated for some other countries; Datt and Ravallion (1989) estimate that the elasticity of the headcount index of poverty to distributionally neutral growth is -2.2 in India (based on 1983 data), and Ravallion and Huppi (1989) obtain an elasticity of -2.1 using Indonesian data for 1984. The elasticities to distributionally neutral growth are higher (in absolute value) for the alternative measures, and highest for the preferred (distributionally sensitive) measure; this was also found in the studies for other countries mentioned above.

The growth elasticity can be sensitive to the choice of poverty line.[10] The elasticity based on the lower poverty line in Table 3 is close to the value of about two obtained for other countries in the above studies. The lower poverty line generates headcount indices which are a good deal closer to the figures for India and Indonesia, and so it appears that much of the difference between these countries in growth elasticities is accountable to the fact that the proportion of poor (as judged by the usual local poverty lines) is higher in Bangladesh.

The headcount index of poverty is found to be quite unresponsive to changes in the Gini index of inequality, and rural poverty is actually found to increase slightly with decreases in the Gini for the implicit BBS poverty line; the latter finding reflects the fact that the rural poverty line is

slightly above the rural mean consumption for 1981/82. As one would expect, the distributionally sensitive poverty measure is far more responsive to changes in overall inequality.

It should be recalled, however, that the change in the Gini coefficient postulated here is associated with a specific shift in the Lorenz curve, whereby inequality falls across the whole range of the distribution. A reduction in inequality which is concentrated more amongst the poorer half (say) would naturally have a stronger impact on a distributionally sensitive assessment of aggregate poverty.

The results in Table 3 can be used to calculate the distributionally neutral growth rates which would be needed to achieve any specified targets for poverty alleviation in Bangladesh. This uses the fact that the rate of change in poverty over time is given by (to a first order approximation) the product of the growth rate in mean consumption per capita and the elasticity of poverty with respect to the mean.

For example one may ask: What is the minimum growth rate in mean consumption that would be needed to reduce the aggregate number of the poor in Bangladesh, without altering relative inequalities? To a first-order approximation, the answer is simply the ratio of the population growth rate to the elasticity of the headcount index with respect to the mean, as reported in Table 3. Since the growth elasticity is found to be about one using the BBS poverty line, we can identify a simple rule-of-thumb: Unless the rate of growth in aggregate real consumption is at least twice as high as the rate of population growth, the absolute number of poor in Bangladesh will increase.

Some caveats should, however, be noted:

(i) The growth elasticity of poverty is likely to change over time; the elasticity is a function of the mean (as well as the Lorenz curve parameters), and its derivative with respect to the mean can be readily calculated. Table 3 gives the log derivatives in the mean for both elasticities (the formulae are given in Ravallion and Huppi, 1989). The absolute elasticity of the headcount index to distributionally neutral growth in Bangladesh is an increasing function of the mean. Thus, with growth in the mean, the minimum growth rate needed to alleviate poverty (in terms of absolute numbers of poor) will start to fall. However, this effect turns out to be quantitatively small; a one percent increase in the mean will increase the absolute growth elasticity of the headcount index by only about .0001 (Table 3). Note also that growth will lead to an increase in the elasticity of poverty with respect to the overall Gini (Table 3); the proportionate poverty alleviation effects of reductions in overall inequality will increase with growth in mean consumption, though, again, the quantitative effect is not found to be large (Table 3).

(ii) It should also be recalled that this rule-of-thumb assumes that growth is distributionally neutral; literally speaking, that is quite rare. However, it is instructive to note that the Lorenz curve in Bangladesh has changed little over time (Figures 1 and 2), and the headcount index seems fairly unresponsive to at least "proportional" shifts. Thus, the above rule-of-thumb may still give quite a good approximation, given the type of growth observed over recent times.

(iii) The above calculation may be rather sensitive to the choice of the poverty line, and that choice is always likely to be somewhat arbitrary. At three-quarters of the BBS poverty line, the absolute elasticity to growth is

found to be higher (Table 3). A rate of distributionally neutral growth of 1.3% per annum would be sufficient to prevent an increase in the number of people below three-quarters of the BBS poverty line, at the current population growth rate.

Over the last decade or so, Bangladesh has not achieved a rate of growth in real national income or consumption in excess of twice the rate of population growth. The compound annual growth rate of real GDP was 4.4% over the period 1972 to 1987; the population growth rate over the same period was 2.4% (World Bank, 1988). So, extrapolating from recent trends, a continuing increase in the number of people below the BBS poverty line must be anticipated.

More encouragingly, however, some observers are currently projecting the rate of growth in real GDP per capita in Bangladesh over the next ten years to exceed that of the 1980s. It may not be unreasonable to expect a distributionally neutral growth rate in consumption per capita of at least the current rate of population growth, and, hence, stable or slightly falling numbers of poor in Bangladesh between now and 2000. A better performance than this would appear to be unlikely under current external and domestic conditions. If a per capita annual growth rate of 2.4% can be achieved without adverse shifts in relative inequalities, or an increase in the rate of population growth, then absolute numbers of poor in Bangladesh will stabilise (or fall slightly if one prefers to use a lower poverty line). The headcount index of poverty will fall at roughly the same rate, while the poverty gap measure and the distributionally sensitive measure will fall at about 5% and 6% per year respectively.

One can also use the results of Table 3 to estimate the deterioration in overall inequality which would be sufficient to eliminate the otherwise desirable effect of growth on poverty in Bangladesh. The headcount index of poverty will not be very sensitive to growth associated with an increase in inequality, assuming that this entails a proportionate shift in the Lorenz curve, as discussed above. It would take a 13% annual increase in the Gini index to eliminate the desirable effect of a 2.4% growth rate on the headcount index of poverty, using the lower poverty line.[11] This would imply a substantial increase in the Gini index, from 0.27 to 0.50 over five years. It would clearly take a highly inequitable growth process to undercut the desirable impact of growth on the proportion of poor in Bangladesh.

However, that conclusion is not robust to the choice of poverty measure. One finds that, for the distributionally sensitive FGT poverty measure, an increase in the Gini coefficient of only 4.1% per year would be sufficient to wipe out the effect on poverty of a 2.4% annual growth rate in mean consumption. This would be equivalent to an increase in the Gini from 0.27 to 0.33 over five years, which is not inconceivable. Thus, even seemingly small deteriorations in overall equity associated with growth can substantially impede progress in alleviating the most severe extremes of poverty in Bangladesh.

IV. Conclusions

The recent evidence of a decline in absolute numbers of poor in Bangladesh during the 1980s is unconvincing. The rate of growth in real consumption per capita of 10% per year implied by the underlying household expenditure surveys is too high to be believed. While it should not be

assumed that the national accounts are accurate, their implied growth rate of about 0.5% per year is more plausible. Assessments of growth during the 1980s consistent with national accounts data (only using the household surveys to measure relative inequalities) suggest that the proportion of the population deemed to be poor has remained fairly stable over recent years, while absolute numbers of poor have increased.

Per capita growth rates in Bangladesh have been below the average for South and South-East Asia in the 1980s, and few observers expect this to change in the 1990s. Furthermore, the growth rates needed to prevent an increase in the absolute numbers of poor in Bangladesh, or to attain any given rate of poverty reduction, are higher than similar calculations have suggested would be needed for some other low-income countries in Asia. At a widely assumed poverty line for Bangladesh, the growth rate of real consumption per capita has to be at least equal to the rate of population growth before the absolute number of the poor can start to fall appreciably without a shift in relative inequalities. Such a growth rate has not been achieved in recent times, but it is expected over the next ten years or so by some observers. By contrast, India and Indonesia will only require a per capita growth rate of at least half the rate of population growth to further reduce the numbers of poor assessed by local poverty lines; both countries have done a good deal better than this over the last 10 years, and that is expected to continue. Recent growth in Bangladesh has thus been relatively low in a country where it needs to be relatively high to avoid an increase in the number of poor.

Certain changes in relative inequalities could, in principle, wipe out poverty alleviation through growth. It appears that a fairly substantial distributional change would be needed to do so for the simple headcount index

of poverty in Bangladesh, which I find to be quite insensitive to stylized changes in overall inequality.

Currently anticipated growth in Bangladesh is likely to have a larger proportionate impact on other measures of poverty, including measures which attach higher weight to the poorest of the poor, and measures which use a lower poverty line. These measures will also be more sensitive to any associated deterioration--or improvement--in overall equity. Only if one is content to focus attention solely on the "not-so-poor" moving across the poverty line, can one reasonably dismiss concerns about how equitable the process of growth will be in the near future. International assistance and domestic policy reforms which not only enhance the rate of growth, but also ensure that its benefits are shared widely, should be strongly encouraged as part of a poverty alleviation strategy for Bangladesh.

Appendix

This appendix summarizes the various formulae used in the paper's calculations. The FGT class of poverty measures P_α used in sections 2 and 3 can be written as:

$$P_\alpha = \int_0^z (1 - y/z)^\alpha f(y)dy \quad \alpha \geq 0 \tag{A1}$$

where f(y) denotes the probability density function of income y, and z is the poverty line. Following Kanbur (1987) and Kakwani (1989) it is readily verified that the elasticity of P_α with respect to the mean of the distribution of y, holding the Lorenz curve constant, is given by

$$\eta_\alpha = -zf(z)/P_0 \quad (\text{for } \alpha = 0) \tag{A2}$$

$$= \alpha(1 - P_{\alpha-1}/P_\alpha) \quad (\text{for } \alpha \geq 1) \tag{A3}$$

Under Kakwani's (1989) assumption about the shift in the Lorenz curve, the elasticity with respect to the Gini index, holding the mean μ constant, is given by:

$$\epsilon_\alpha = \eta_0(z - \mu)/z \quad (\text{for } \alpha = 0) \tag{A4}$$

$$= \eta_\alpha + \alpha\mu P_{\alpha-1}/(zP_\alpha) \quad (\text{for } \alpha \geq 1) \tag{A5}$$

Since (like most researchers) I do not have access to the unit record data for Bangladesh, simulation is required to estimate the above poverty measures from the published grouped data. Simulated distributions are also required for estimating the poverty measures based on NA means reported in Section 2. For these purposes I have used Kakwani's (1989) parameterization of the Lorenz curve:

$$L(p) = p - ap^{\gamma}(1-p)^{\delta}e^{\epsilon} \qquad 0 \leq p \leq 1 \tag{A6}$$

which is the cumulative proportion of total income or consumption held by the poorest p proportion of the population. The parameters a, γ and δ are positive, (if neither γ nor δ exceed unity then the Lorenz curve is convex), and ϵ is a random error. The Lorenz parameters themselves are estimated by OLS for each state/sector from the following regression:

$$\ln[p-L(p)] = \ln a + \gamma \ln p + \delta \ln(1-p) + \epsilon \tag{A7}$$

All simulations are at $E\epsilon = 0$. Given the mean and Lorenz function, the distribution function is fully characterized noting that the slope of the generalized Lorenz curve, $L'(p)\mu=x$, is simply the inverse of the distribution function $p=F(x)$. In earlier work on Indonesian data, the Kakwani parameterization was found to give a better fit than some obvious alternatives (namely the original Kakwani-Podder specification and elliptical Lorenz curves), at least in the crucial lower half of the distribution (Ravallion and Huppi, 1989).

The method of calculating the poverty measures then follows Datt and Ravallion (1899). For completeness I summarize the method here. Since $L'(P_0) = z/\mu$, (A6) implies that:

$$1 - aP_0\gamma(1-P_0)^{\delta}\left[\frac{\gamma}{P_0} - \frac{\delta}{1-P_0}\right] = \frac{z}{\mu} \qquad \text{(A8)}$$

which is solved numerically for P_0 (using Newton's method). The poverty gap measure P_1 can be written as

$$P_1 = \int_0^{P_0} [1-(\mu/z)L'(p)]dp$$

$$= (1-\mu/z)P_0 + \frac{\mu}{z}\left[a\gamma B(P_0,\gamma,\delta+1) - a\delta B(P_0,\gamma+1,\delta)\right] \qquad \text{(A9)}$$

where $B(k,m,n) = \int_0^k p^{m-1}(1-p)^{n-1}dp$. The FGT measure for $\alpha = 2$ is evaluated as follows. From the definition of P_2 we know that

$$P_2 = \int_0^{P_0}[1-(\mu/z)L'(p)]^2dp$$

$$= (1-\mu/z)^2P_0 + 2(\mu/z)(1-\mu/z)P_1$$

$$+ (a\mu/z)^2[\gamma^2B(P_0,2\gamma-1,2\delta+1) - 2\gamma\delta B(P_0,2\gamma,2\delta)$$

$$+ \delta^2B(P_0,2\gamma+1,2\delta-1)] \qquad \text{(A10)}$$

Thus, given (μ, a, γ, δ), the FGT poverty measures for any poverty line are calculated from (A8), (A9) and (A10). The probability densities at the poverty line (as required for calculating η_0) are readily estimated using the fact that $f(z) = 1/(\mu L''(P_0))$. All of the above calculations can be performed using SAS.

Footnotes

1. Consumption was estimated by combining World Bank estimates of the share of consumption in GDP, with the Bank's estimates of GDP per capita at 1980 prices, converted to 1981/82 prices using the implicit GDP deflator (all necessary data are contained in World Bank, 1988). Calendar figures were then converted to a two year moving average for comparison with the HES.

2. It appears that average income may well have been underestimated in 1981/82, with important implications for comparisons with the earlier surveys (Osmani, 1989). However, the same bias is not evident in the 1981/82 consumption data.

3. There are other applications of this idea; for example, Ravallion and Huppi (1989) use the same method to derive a decomposition of observed changes in poverty between two dates into effects due to growth in the mean, holding the Lorenz curve constant, and the effect of shifts in the Lorenz curve.

4. BBS nominal poverty lines appear to have been constructed by graphing mean calorie intake against mean income based on grouped data and using this graph to find the income level at which households typically attain the predetermined caloric norm. There is nothing to guarantee that the poverty line so determined will have constant purchasing power in terms of any relevant bundle of goods, or correspond to any given reference "utility" level.

5. The following table gives the BBS nominal poverty lines for each year, and their real values using the Dhaka CPI (middle income groups) for urban areas, and the average rural CPI. Some alternative urban deflators are also given.

Real values of BBS poverty lines		1981/82	1983/84	1985/86
Urban	Nominal	300	439	519
	Real (CPI Dhaka)	300	364	353
	(CPI food)	300	361	348
	(Rice)	300	367	376
Rural	Nominal	192	300	331
	Real (CPI rural)	192	252	235

6. Although my rural poverty line is slightly higher than the BBS poverty line quoted in note 2 above, it actually gives a closer fit to the BBS (1988b) estimates of the rural headcount index for 1981/82, using the published grouped data and the Lorenz curve parameterization (Appendix). But one should not be too concerned about accuracy in choice of a poverty line in this context, given the level of accuracy of other relevant inputs to the calculations, such as the grouped data, the original survey data, and the

underlying caloric requirement. We are, at best, talking about rough orders of magnitude.

7. When normalized by the number of poor (which gives the original version of the poverty gap measure, as discussed in Sen, 1976, for example), the poverty gaps represented 36% of the poverty line in urban areas and 34% in rural areas.

8. By a "reduction in inequality" I mean here any unambiguously upward shift in the Lorenz curve.

9. Following Kanbur (1987) and Kakwani (1989); see the Appendix for further details.

10. The condition required for the elasticity of the headcount index in the mean to be independent of the poverty line is quite restrictive. The elasticity will only be invariant to the poverty line if its value is equal to one plus the elasticity of the probability density function of consumption evaluated at the poverty line. This follows straightforwardly from the formula given in the Appendix.

11. This is given by the growth rate times the ratio of the growth elasticity to the Gini elasticity in Table 3. I have only used the lower poverty line for this calculation, given the perverse effect of changes in the Gini index on the headcount for the higher line, associated with the fact that it is above mean consumption for rural areas, as discussed above.

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Table 1. **Alternative Estimates of Real Consumption per Capita.**

	1981/82	1983/84	1985/86
Using the Household Expenditure Survey:			
Urban	317.9	328.8 (3.4)	395.1 (20.2)
Rural	173.0	239.0 (38.2)	265.5 (11.1)
National	193.2	249.4 (29.1)	281.9 (13.0)
Using national accounts (World Tables):			
National	196.0	201.1 (2.7)	199.8 (-.65)

Note: Taka per person per month, 1981/82 prices. Percentage changes over previous HES year in parentheses.

Table 2: Alternative Measures of Poverty in Bangladesh

Poverty measure			1981/82	1983/84	1985/86
Headcount index (BBS 1981/82 poverty line, CPI adjusted)	Urban	HES	62.3	54.6	43.7
		NA	62.3	55.2	58.2
	Rural	HES	72.7	42.3	34.8
		NA	72.7	69.6	72.3
	National	HES	71.2	43.7	35.9
		NA	71.2	67.9	70.5
Headcount index (Three-quarters of BBS poverty line)	Urban	HES	42.0	33.3	23.8
		NA	42.0	33.9	37.2
	Rural	HES	47.9	19.4	12.4
		NA	47.9	43.2	46.3
	National	HES	47.1	21.0	13.8
		NA	47.1	42.1	45.1
FGT Poverty gap (α=1)	Urban	HES	22.2	17.5	12.3
		NA	22.2	17.8	19.3
	Rural	HES	24.5	10.7	7.2
		NA	24.5	22.6	23.4
	National	HES	24.2	11.5	7.8
		NA	24.2	22.0	22.9
Distributionally sensitive measure (α=2)	Urban	HES	10.3	7.5	4.7
		NA	10.3	7.6	8.4
	Rural	HES	10.6	4.0	2.2
		NA	10.6	9.7	9.7
	National	HES	10.6	4.4	2.5
		NA	10.6	9.5	9.5

Note: All poverty measures expressed as percentages.
HES: Sample mean from Household Expenditure Survey
NA: Mean is estimated from national accounts, except for 1981/82 which uses HES (see text).

Table 3. Elasticities of Poverty Measures to Distributionally Neutral Growth and Reductions in Inequality, 1981/82.

Poverty measure		Elasticity with respect to: mean	Gini
Headcount index (BBS 1981/82 poverty line)	Urban	-1.08 (-0.012)	0.06 (0.012)
	Rural	-1.05 (-0.011)	-0.14 (0.008)
	National	-1.05	-0.12
Headcount index (Three-quarters of BBS poverty line)	Urban	-1.69 (-0.029)	0.66 (0.036)
	Rural	-1.90 (-0.036)	0.29 (0.027)
	National	-1.87	0.34
Poverty gap (α=1)	Urban	-1.80 (-0.020)	1.17 (0.031)
	Rural	-1.97 (-0.027)	0.60 (0.022)
	National	-1.95	0.67
Distributionally sensitive measure (α=2)	Urban	-2.32 (-0.022)	2.26 (0.047)
	Rural	-2.61 (-0.030)	1.38 (0.036)
	National	-2.57	1.50

Note: Derivative with respect to the log of the mean is given in parentheses.

Figure 1
Lorenz Curves for Urban Bangladesh

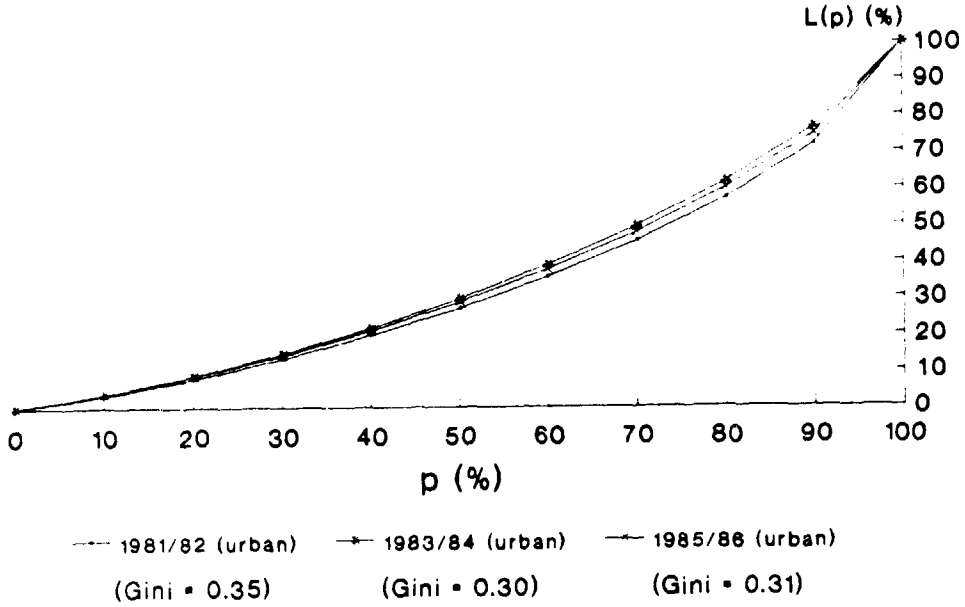


Figure 2
Lorenz Curves for Rural Bangladesh

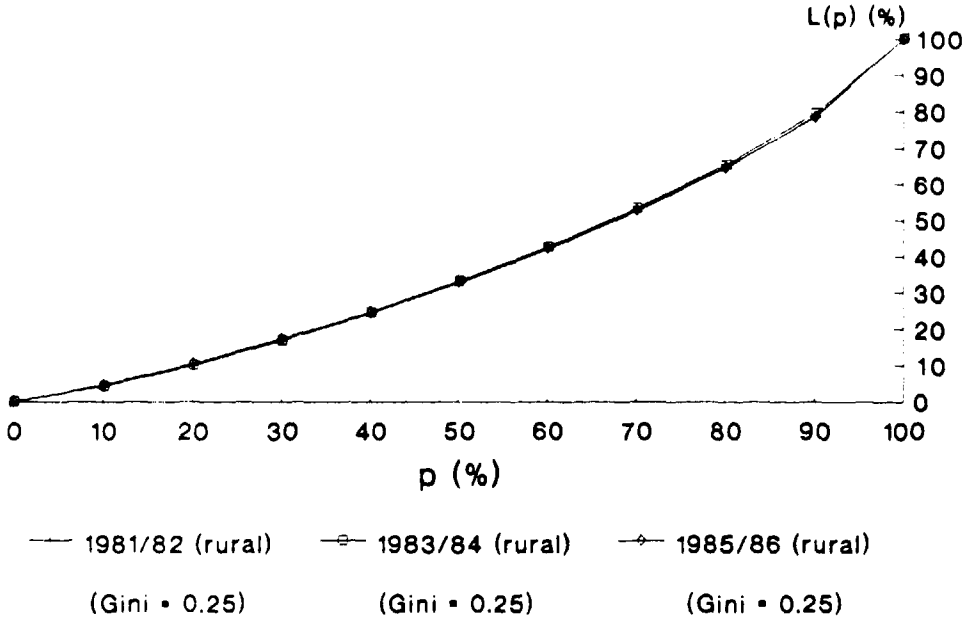
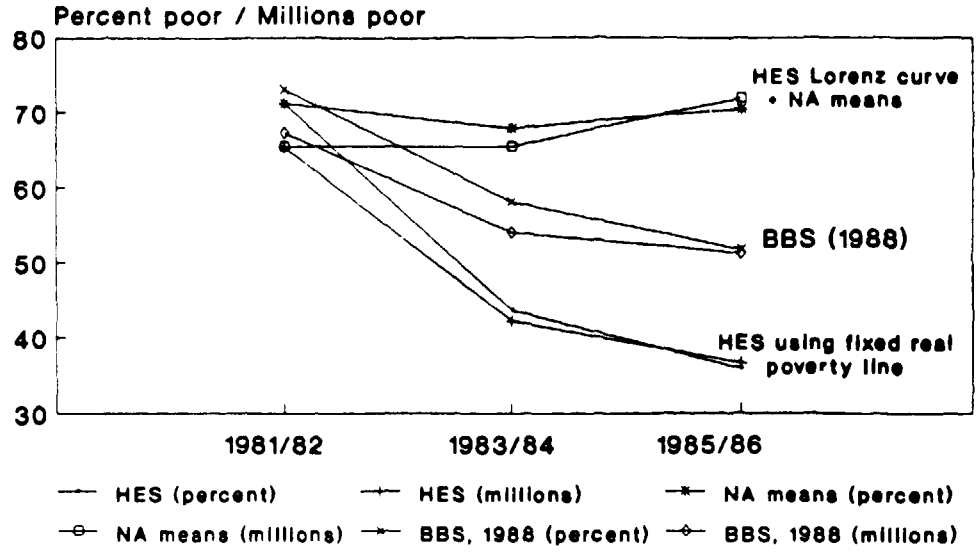


Figure 3
Estimates of Poverty in Bangladesh



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